

regards time measurements, they were not taken automatically and were, therefore, not true to a fraction of a second. Repeated experiments, however, demonstrated that this source of error was minimal, and, furthermore, our object was not to measure the exact time rate. We did not sever the anterior crural, because we found this procedure to be unnecessary. Our object was not to cut off all impulses, but to block out most of them.

The task now remains to confirm by visual inspection the statement that the peripheral vessels are contracted. For reasons already stated, we selected the retina as our field for this part of our work, and we are indebted to Dr. John Green, Jr., for our ophthalmic reports. Unfortunately, we failed in efforts to devise a scheme for measuring, with absolute accuracy, the diameters of the retinal vessels. In order that Dr. Green might not be prejudiced by the facts already secured by us, he was not told about them, being merely requested to examine the fundi of the dogs' eyes, before and after shock was induced, and to note carefully the size of the vessels. He took the size of the optic disc as his standard and compared the size of the vessels with it. In every instance he reported that the vessels showed a marked degree of contraction after the animal was in shock. The vessels contracted down to from one-third to one-half of their size before shock.

Two observations were particularly interesting: In one case the dog died immediately after an examination of the fundus which had disclosed marked contraction of the vessels, thereby demonstrating that vasoconstriction persisted up to the very point of *exitus lethalis*. Unfortunately, we neglected to examine any of the fundi after death in order to see if vascular relaxation occurred. The second observation of especial interest was a case in which the retinal vessels were contracted so tightly as to make them resemble mere strands. In this connection it is interesting to note that ophthalmic literature contains at least two reports²² of sudden blindness occurring during shock, lasting from two to five hours, and then passing off without leaving any demonstrable eye changes or disturbances of vision. Roberts, who makes these reports, does not give the fundus findings during the state of shock, nor does he attempt to explain the cause of the blindness; but it seems fairly reasonable to assume that the occurrence of a sudden acute anemia of the retina, resulting from pronounced contraction of the retinal vessels, might cause transient blindness.

CONCLUSION

In conclusion it is important again to emphasize the fact that the experimental work detailed in this paper is in no sense of the word to be taken as an explanation of the causative factor or factors of shock. Just as Porter claims to show explicitly that in shock the vasomotor center is not exhausted and, therefore, implicitly that the peripheral vessels are not paralyzed, so we try to show explicitly that the peripheral vessels are contracted, and implicitly that not all the vasomotor centers can be exhausted. The complexity of the vasomotor apparatus with its multiplicity of centers, and the seemingly independent action of many of these centers, render it impossible to frame a satisfactory theory based on our results. This much may be said with assurance: If the work herein detailed stands the test of confirmation, then the doctrine that shock is due to vasomotor exhaustion must be revised.

Clinical Note

A TYPHOID BACILLUS CARRIER

HISTORY AND AUTOPSY

F. S. HAMMOND, M.D.

Assistant Physician and Pathologist, New Jersey State Hospital at Trenton; Pathologist to the Mercer Hospital
TRENTON, N. J.

Since the comparatively recent discovery of what may be termed latent typhoid infection and its bearing on the spread of the disease, as well as its pathologic and bacteriologic significance, additional examples of this condition have been reported repeatedly.

As yet, however, the number of postmortem examinations of bacillus carriers has not been large, and the present instance is cited, not only as an example of the possibilities of transmission of infection under certain circumstances, but as an additional confirmation of the generally accepted belief in the origin of the bacilli in such cases.

HISTORY OF A BACILLUS CARRIER

The individual in question was a colored man admitted as a patient to the New Jersey State Hospital at Trenton in 1902. He was at that time sixty-seven years old, and presented then, or subsequently, nothing beyond the gradual mental and physical failure incident to his age, and was able to perform such light work as was assigned him.

During July and August, 1907, the institution was visited by an epidemic of typhoid fever, due to the contamination of a spring from a leaking city sewer, over one hundred cases resulting, with the usual mortality.

The patient (C.C.) then seventy-two years of age, became ill early in August, and responded positively to the agglutination test on the 13th. The course of the disease was exceptionally mild; the temperature was at all times low, rarely above 100 F.; and there were few, if any, subjective or objective symptoms, so that, in spite of his age and comparative weakness, the patient was able to be about in a little over three weeks from the time of onset. Indeed, so mild was the disease that the diagnosis was made entirely on the Widal reaction, this test being made at this time on all patients showing any signs of ill health whatever. In the absence of an epidemic it is probable that the few symptoms observed would have given no indications of the condition.

He made an uneventful recovery, and very quickly regained his usual health.

During the fall and winter (1907), following the epidemic, bacteriologic examinations of the urine of all convalescent patients (including C.C.) were made at the hospital laboratory, three examinations each of fifty-two convalescents being performed. Digalski-Conradi agar medium was used for this purpose, and in no instance were suspicious organisms isolated.

All patients were at this time kept segregated after having had typhoid and hexamethylamin (urotropin) systematically administered over a period of months. Subsequent to the urine examinations, in the spring of 1908, the Research Laboratory of the New York Health Department, under the direction of Dr. W. H. Park, undertook the examination of the feces of the same individuals, samples being sent to New York for this purpose. Three or more examinations of specimens from each patient were made, and, as already reported by Dr. Park,¹ two bacillus carriers were discovered, one being the patient C. C. Four consecutive fecal examinations of this patient during March and April each showed typhoid bacilli in large numbers. He was at once isolated and rigid disinfection of all discharges carried out. No further cases occurred. It is here of interest to note what would have been the inevitable consequences, had not these individuals been recognized.

1. Park, William: Typhoid Bacilli Carriers, THE JOURNAL A. M. A., Sept. 19, 1908, li, 981.

22. Roberts, W. O.: Am. Pract. and News, 1907, p. 24.

As is now generally conceded, the opportunities and frequency of contact typhoid infection under ordinary circumstances are great, but in large institutions, particularly for the insane, these are enormously multiplied.

Where large numbers of patients are in close daily contact in dormitories, wards and dining rooms, many of whom from their mental condition are careless or filthy in their habits, the direct transference of infection, in spite of all ordinary precautions and watchfulness, is unavoidable. Nieter and Liefmann, in 1906, reported a series of typhoid outbreaks in an insane asylum due to this cause, and Friedel in the same year cites another instance in which sixty-three cases resulted in another similar institution. Liebtrau speaks of an attendant in a jail who caused four cases, but who had herself never been ill.

Following his isolation, the history of C. C. was uneventful, and nothing of note in his physical condition was observed up to his last illness, with the exception of a trifling and irregular diarrhea, alternating with mild constipation.

Although the gall bladder and small intestine were found involved at autopsy, no essential symptoms of these conditions were observed during life. C. C. continued in his usual condition, though gradually failing in strength from old age, up to within six weeks of his death when he developed an irregular temperature, accompanied by signs of thoracic disease, became progressively weak and emaciated, and died Oct. 16, 1908, one year and three months after having had the attack of typhoid.

AUTOPSY

The autopsy was performed three and a quarter hours after death. Nothing beyond a senile appearance and rather marked emaciation was noted externally. The brain was typical of senile atrophy, and close inspection of the pia failed to detect anything except the usual changes of this condition, though microscopically an interesting condition was discovered. The left seventh rib was found detached from the vertebra at the articular process, and the severed ends were surrounded by a small pocket of thick yellow pus.

The left pleura was enormously thickened, and the lung deeply engorged and firmly attached to the chest wall. The upper lobe of the right lung showed lobar consolidation, and the heart a rather severe grade of brown atrophy. The aorta and other large trunks were sclerotic and contained a moderate number of atheromata. The spleen was small, tough and fibrous, but macroscopically showed nothing further. The liver was small, mottled in appearance, uneven on the surface and thickly studded with minute grayish solid bodies and fasciculi taken at autopsy to be fibro-connective tissue.

On making a minute opening in the gall bladder for the purpose of taking cultures, a small amount of clear mucoid bile escaped; the rest of the bile, however, which completely filled the gall bladder, was dark yellowish brown, thick and partially inspissated. A dark greenish-black, smooth oval calculus, 1.5 by 0.5 cm., was present; and the mucosa was very dark and slightly thickened. The cystic, hepatic and common ducts were unobstructed.

There was a well-marked chronic interstitial nephritis, and one kidney contained a small sclerotic nodule at the junction of the cortex and medulla. The mucosa of the bladder was slightly injected, but otherwise negative.

In the intestine there were irregular areas in which the mucosa was mildly injected, and two small ulcers were found, each about 0.5 cm. in diameter. One was situated in the lower portion of the ileum, the other in the cecum. Both were circular, sharply circumscribed, involved the mucosa only, and showed complete absence of induration or surrounding reaction.

It was thought that, anatomically, we were dealing with a possible traumatic fracture of the seventh rib with secondary infection and involvement of the left pleura, a chronic senile leptomeningitis, fibroid spleen, and a rather marked chronic interstitial hepatitis.

On microscopic examination, however, the thickened pleura was seen to contain many characteristic giant cells, and the liver and spleen were studded with numerous and closely set

minute miliary tubercles, while the pia was the seat of the earliest stage of tuberculous meningitis. In fact, there had been a rapid and general dissemination of acute miliary tuberculosis, probably arising from a necrotic rib.

Whether this was primarily a post-typhoid necrosis secondarily infected with tubercle bacilli remains in doubt, though from its apparent comparatively recent occurrence this was probably not the case.

BACTERIOLOGIC EXAMINATION

Cultures were taken on lactose litmus agar from the region of the intestinal ulcers, the liver and bile. The latter were made in definite decimal dilutions from 1 to 0.00001 c.c., using sterile water as a diluting fluid, and incubated at 37.5 C.

On the plates made from the intestinal ulcers many red colonies developed, chiefly of the colon group, but none showed any resemblance to typhoid organisms, either on the plates or by subcultivation.

In twenty-four hour observations of the bile plates no colonies whatever could be distinguished on those made from the undiluted bile, or on the dilutions up to 0.0001 c.c., although a very delicate film appeared to cover the surface of the medium, which was unaltered in color. On the 0.0001 plate innumerable minute blue points could be distinguished with a hand lens, while on the plate of highest dilution (0.00001) an enormous number of distinct delicate bluish colonies could be seen, all of which were identical in appearance. It was impossible to count the colonies accurately, but it was estimated that they numbered between 1,500 and 2,000.

The plate cultures made from the liver by smearing a small bit of excised tissue over the bottom of the plate before pouring the agar, showed identical colonies varying in numbers from 100 to 1,000 on each plate. About twenty of the colonies from the bile and liver were subcultivated and tested for agglutination with a known typhoid serum tested against a stock culture of typhoid bacilli. The reaction was prompt and vigorous in dilutions of 1 to 50. A number of stains were then selected and subjected to cultural tests the results of which corresponded in every instance to those of *Bacillus typhosus*.

In stating the probable number of typhoid bacilli present in the bile in this instance, only approximate figures can be given, since the enormous overgrowth even in the highest dilution, obviously places the numbers too low, but as a conservative estimate it is safe to say that there were at least 20,000,000 per c.c., basing the estimate on the number of colonies developing on the least crowded plate.

The numbers developing in the liver cultures were correspondingly large, although from the nature of the material it is impossible to give these in as definite a manner as with fluids such as bile.

That the bacilli are found in the liver when present in the gall bladder is shown by the case reported by Levi and Kayser, who at autopsy of a bacillus carrier found them in the wall of the gall bladder, the liver and inside of calculi. In this instance the autopsy was performed nineteen hours after death, and the findings suggest that the bacilli invade the liver, postmortem, through the bile ducts.

This is believed to be the case in the present instance, for although tubercle bacilli were readily demonstrated in sections of the liver fixed in alcohol, the most careful search failed to detect the presence of either colonies or isolated bacilli in any portion of the liver tissue examined.

In an autopsy cited by Nieter and Liefmann, in 1906, they found not only the gall bladder involved and containing the organisms, but also a chronic catarrh of the lower intestine and many typical old typhoid ulcerations. This patient had suffered from chronic dysentery during life.

In the present case the patient also showed a mild catarrhal condition of the intestine, and ulcerations were present, but in no way did either lesion resemble a long-standing or chronic condition, nor were the ulcers of a nature to suggest a typhoid origin; and from the appearance of the lesions, rather than the failure to cultivate typhoid bacilli from them, they are regarded as unconnected with the infection of the gall bladder or the presence of the bacilli in the stools.

SUMMARY

The points of interest in the present case are:

The race and age of the individual (73 years at time of death).

The extreme mildness of the primary disease.

The constant presence of the organisms in the stools and their absence in the urine, following the attack.

The apparent failure of progressive and, toward the last, severe senile changes, together with an intense and widely disseminated tuberculous process to influence the course of the chronic typhoid infection.

The enormous numbers of the organisms found in the gall bladder and liver at autopsy.

The futility of hexamethylamin as a treatment for typhoid infection of the gall bladder.

And, finally, the extreme value of fecal examination of post-typhoid subjects in institutions where control is possible and the practice of rigid isolation and disinfection when carriers are discovered.

I am indebted to Drs. Sandy and Taylor of the State Hospital, under whose care the patient was, for the clinical facts, and to Dr. W. H. Park for the reports of the fecal examinations.

Therapeutics

ASTHMA

(Continued from Vol. LI, page 2160)

The best treatment of the paroxysm of asthma must be decided by a careful study of each individual patient. There is no one best treatment for the asthmatic attack. The drug that most frequently is successful in rendering the patient comfortable and shortening the paroxysm is, of course, morphin, but before the physician begins the treatment of the asthmatic attacks with morphin he should have exhausted his other resources, as he is not sure that he can cure the asthma, even if he removes the reflex cause, and such patients readily acquire the morphin habit. If a given patient is incurable under the surroundings and conditions in which he must live and no other drug will relieve his suffering, he doubtless has the right to receive morphin, even if he does form the habit.

In endeavoring to abort or shorten the attacks we may have recourse to the narcotics, which relieve the paroxysm by inhibiting the reflexes and dulling the receptive centers. Such drugs are morphin, bromids, chloral, and chloroform by inhalation.

Lobelia is depressant both to the circulation and to the nervous system, and can only be of value in sufficient dose to cause actual depression. It acts similarly to chloral and bromids, and probably no better.

Grindelia robusta depresses the circulation and depresses the nervous system, and is a narcotic. It also dilates the pupils. Consequently the action is not very dissimilar to chloral. It has often been used in bron-

chitis and asthma and in whooping cough to relax or prevent spasm. It has no advantage over chloral or bromids.

We may use drugs that dull the peripheral nerves and prevent their susceptibility to the irritation from which they are suffering and thus abort the paroxysm. Such drugs are mostly of the atropin group, as belladonna, stramonium and hyoscyamus. The effective action is atropin action, and doubtless atropin, and perhaps scopolamin (hyoscin) will do all the good that the crude drugs can do, although inhalation of the fumes from burning stramonium leaves has been used with success for centuries.

We may consider the treatment with such drugs as cause muscular relaxation by prostration. Such are emetics, and nicotin with patients who are not used to its action.

The next group of drugs whose action we consider in the treatment of asthmatic attacks are vasodilators. These drugs not only dilate the peripheral blood vessels and therefore relieve congestion in the mucous membranes of the respiratory tract, but also are preventers of muscular spasm. Such are, of course, the nitrites in the form of amyl nitrite, sodium nitrite, and nitroglycerin. The iodids will also cause lowered blood pressure, but are hardly of value during the attack.

Many times quite the reverse of this dilating, relaxing treatment is indicated in an asthma paroxysm. The vasoconstrictors are indicated, and if used in these instances will abort the attack. The best are suprarenal solutions sprayed on the mucous membranes of the nostrils or throat, or into the larynx, or a suprarenal or adrenalin tablet may be dissolved and absorbed in the mouth. The action is of course immediate, and sometimes so is the relief. For the nostrils adrenalin spray solutions of from 1 to 10,000 to 1 to 5,000 (diluting with a mild alkaline solution) may be used. In the throat and larynx a strength of 1 to 3,000 may be used. Digitalis is sometimes of advantage in these attacks even if there is no cardiac lesion or cardiac debility. Intramuscular injection of an aseptic preparation of ergot is also sometimes efficient treatment in stopping the paroxysm.

Citrate of caffeine, or strong coffee, or strong decoctions of tea are of benefit during the asthmatic attack in some individuals. The favorable action of caffeine must be due to the cardiac stimulation and possibly to stimulation of the respiratory center.

Strychnin given hypodermatically has been much recommended for the asthmatic attack. While it generally fails, it sometimes does a great deal of good to patients who have bad heart action. A combination of strychnin, morphin, and atropin given hypodermatically sometimes seems to act better than when the strychnin is omitted. Arsenate of strychnin in doses of perhaps 1/40 of a grain three times a day has been recommended in chronic asthma. This drug is very active and may cause unpleasant symptoms.

Almost from ancient times paroxysms of asthma have been treated by the inhalations of fumes from burning medicinal substances. For this purpose the medicated substance may be in the form of cigarettes, powder, cones, or papers. Sometimes the fumes of these burning powders are directly inhaled, or the patient's bedroom is allowed to become filled with the fumes. Sometimes the attack is relieved by the inhalation of steam, or the vapor of boiling water in the room of the patient adds some relief. Sometimes liquid medicaments are